DETAILED DESCRIPTION [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the cooling system of the engine which uses a Magnesium alloy for the components in contact with direct coolant, such as the cylinder head and a cylinder block.

[0002]

[Description of the Prior Art] Since the combustion temperature in the combustion chamber in engine operation and a cylinder becomes an elevated temperature very much, in order to protect engine component parts, such as a cylinder block and the cylinder head, no matter an engine may be operated on what conditions by forming a cooling system and circulating the coolant compulsorily to the circumference of a combustion chamber and a cylinder bore by the water pump, things held to optimal temperature so that there may be nothing -- each part is overheated -- are performed from the former.

[0003] Moreover, if it was in the conventional engine, for lightweight-izing, a cylinder block and the cylinder head were manufactured with the aluminium alloy, and forced circulation of the coolant was carried out to the cylinder block and cylinder head.

[0004]

[Problem(s) to be Solved by the Invention] However, the large improvement in fuel consumption is demanded in recent years. For this reason, much more engine lightweight-izing is required.

[0005] For much more engine lightweight izing, it is most effective to manufacture the cylinder block which are important figure components, and the cylinder head with a Magnesium alloy with specific gravity smaller than an aluminium alloy.

[0006] However, although the corrosion resistance in the inside of atmospheric air improved sharply when magnesium alloy castings removed the impurity in an alloy, there was a trouble that the water-jacket wall of a cylinder block or the cylinder head in contact with the engine coolant corroded during the engine operation of long duration.

[0007] This invention is made paying attention to such a conventional trouble, and aims at offering the cooling system of the engine made from a Magnesium alloy which raised the corrosion resistance which receives the coolant.

[0008]

[Means for Solving the Problem] For this reason, in the engine which uses a Magnesium alloy for the components in contact with an engine coolant, this invention prepared the branching coolant path of another network which branched from the engine coolant path, and arranged in this branching coolant path the ion stripper which builds in the ion remover which removes the ion in the coolant.

[0009]
[Function] Various kinds of ion with which a part of coolant flows the inside of the ion stripper arranged in the branching coolant path, and it makes a Magnesium alloy corrode is removed.
[0010]
[Example] Hereafter, this invention is explained based on a drawing. Drawing 1 R> 1 - drawing 4 are drawings showing the 1st example of this invention.
[0011] Drawing 1 explains the configuration of the 1st example, and the flow of the coolant first. A cylinder block 8 and the cylinder head 9 are constituted by the Magnesium alloy excellent in a light weight and vibration proof. The branching coolant path 3 which arranged the ion stripper 1 and the closing motion valve 2 branches from the cylinder block 8 of the same cooling circuit as the cooling circuit of the same engine as usual, and is prepared between the cylinder block 8 and the water pump 7.
[0012] The cooling liquid flow after a warm-up is explained first. Since the coolant is as ******** completely in after an engine warm, the thermostat 6 which controls whenever [cooling solution temperature] is opened.
[0013] Therefore, the coolant cooled with the radiator 4 circulates with the radiator 4 -> thermostat housing 5 -> thermostat 6 -> water-pump 7 -> cylinder block 8 -> cylinder head 9 -> water outlet 10 -> radiator 4, as an arrow head shows to drawing 1 .
[0014] Moreover, a part of coolant from the cylinder head 9 flows with the intake MANHORUDO 11 -> heater core 12 -> water pump 7 or the intake MANHORUDO 11 -> manhole DOKOREKUTA 13 -> throttle chamber 14 -> water pump 7.
[0015] Since the thermostat 6 has closed during cold machine operation, the coolant circulates with the water-pump 7 -> cylinder block 8 -> cylinder head 9 -> intake MANHORUDO 11 -> water pump 7. Moreover, a part of coolant from the cylinder head flows with the cylinder head 9 -> intake MANHORUDO 11 -> heater core 12 -> water pump 7 and the cylinder head 9 -> intake MANHORUDO 11 -> manhole DOKOREKUTA 13 -> throttle chamber 14 -> water pump 7.
[0016] And when the closing motion valve 2 is open, a part of coolant from the cylinder head circulates through the branching coolant path 3 with the cylinder block 8 -> closing motion valve 2 -> ion stripper 1 -> water pump 7. In addition, 15 is a reservoir tank.
[0017] Drawing 2 is the sectional view showing an engine 16. An engine 16 is the so-called product made from cylinder head block monobloc casting with which the cylinder head section 9, and the cylinder block section 8 and the crank-case section 17 were united.
[0018] It is open for free passage to the water jacket 18 to which the coolant flows, and the closing motion valve 2 which opens and closes the branching coolant path 3

which branches from a cylinder block 8 is attached. The closing motion valve attaching hole 19 is established in the cylinder block 8.

[0019] In drawing 2, the upper cap with which a valve guide, and 23 and 24 support a valve seat, and, as for 25, 20 supports a crankshaft as for a cylinder liner, and 21 and 22, and 26 are bearing beams which similarly support a crankshaft.

[0020] An example of the closing motion valve 2 installed in a branching coolant path by drawing 3 is shown. This closing motion valve is a wax type. For the wax with which the temperature sensor was filled up with 27 and it filled up with 28 in the temperature sensor 27, and 29 and 30, as for a shaft and 32, a return spring and 31 are [a rubber member and 33] the outlet sections of branching liquid. In addition, in drawing, the coolant flows in the direction of an arrow head.

[0021] An example of an ion stripper is shown in drawing 4. For the network made from plastics, and 38, as for activated carbon and 40, a filter and 39 are [the ion remover case of an outlet side, and 36 and 37 / the ion remover case where 34 is a coolant entrance side, and 35 / an ion remover and 41] ion remover storage bags. In addition, the coolant from the closing motion valve 2 flows in the direction of the arrow head of drawing.

[0022] Next, an operation is explained. If it is in lightweight-ization of car motor, large weight mitigation is attained by changing into a Magnesium alloy the cylinder block 8 which are important figure components, and cylinder head 9 grade from an aluminium alloy.

[0023] Furthermore, if a cylinder block 8 and the cylinder head 9 are manufactured by monobloc casting as illustrated to drawing 2Since the boss of the cylinder-head bolt set in the conventional another form engine and a cylinder-head bolt, the upper deck of a cylinder block, ROADEKKI of the cylinder head, and a head gasket become unnecessary, with weight mitigation There are also many indirect merits of the cooling nature of the circumference of the improvement in joint rigidity and the combustion chamber lower part of the cylinder head and a cylinder block, and the cylinder bore upper part being improved in addition to miniaturization, reduction of components mark, and improvement in assembly productivity.

[0024] When a cylinder block 8 and the cylinder head 9 are made into the product made from a Magnesium alloy, corrosion prevention measures become very important. Since foundry technique progressed, the latest magnesium alloy castings have little mixing to the casting of an impurity, and the field in contact with atmospheric air etc. has reached the level which has corrosion resistance sufficient by painting on chromate treatment.

[0025] However, even if wall 18a of the water jacket 18 in contact with the engine coolant etc. performs anodizing which excelled [front face / the] in corrosion resistance, it is still inadequate. Therefore, to the coolant, mixing of an impurity is

using little pure water for an antifreezing agent for the magnesium corrosion inhibitor etc. at it, **-izing.

[0026] However, even if it took such measures, there was a trouble that the coolant deteriorated, in prolonged operation. As a cooling factor of an engine coolant, mixing of increase of the metal ion by metal penetration, such as an engine-coolant system, generating of a hydrogen ion and the chlorine by unsuitable irrigation, sodium, and molten metal can be considered.

[0027] In the engine coolant path, in order to prevent coolant degradation by these causes and to press down the corrosion of Magnesium alloy water-jacket wall 18a to the minimum, as shown in drawing 1 , this example formed the branching coolant path 3 which branched from the cylinder block 8, and arranged the closing motion valve 2 which detects, opens and closes cooling solution temperature, and the ion stripper 1 which removes the ion generated in the coolant.

[0028] If it is in the cooling system of the usual car motor, the coolant around a maximum of 100l. circulates per minute. Since coolant capacity is 5-10l., the coolant will take a round of the inside of a cooling path in several seconds at the time of the maximum stream flow. Moreover, even if some impurities mix into the coolant, the corrosion of water-jacket wall 18made from Magnesium alloy a does not advance to the inside of a short time. When the impurity in the coolant is 10 ppm or less, it is thought that corrosion hardly advances. (however -- since a chlorine ion performs a catalysis -- a slight amount -- even when -- ****** -- it is harmful.) since the coolant mainly concerned with pure water has little mixing of an impurity, the corrosion of wall 18a of a water jacket 18 does not advance. In addition, deionizer effectiveness of the ion stripper 1 can be made 90% or more, and once the coolant containing the impurity which is number +ppm passes the ion stripper 1, it does not need to pass an ion stripper frequent again after that.

[0029] Therefore, as shown in drawing 1 , if the coolant is branched to the ion stripper 1 and it lets a part of coolant pass to it, it is enough for it.

[0030] The closing motion valve 2 of a cooling solution temperature detection mold is shown in drawing 3 . The closing motion valve 2 is attached in the closing motion valve attaching hole 19 of a cylinder block 8 as shown in drawing 2 .

[0031] The closing motion valve 2 shown in drawing 3 is a wax type. When cooling solution temperature rises, a wax 28 expands, and a shaft 31 moves below by drawing 3, and intercepts the branching coolant path 3. The operating temperature of the closing motion valve 2 has 60-degree-C order of a little a low eye more desirable than the laying temperature of the thermostat 6 which controls the engine coolant.

[0032] The ion stripper 1 is shown in drawing 4. It deforms and the networks 36 and 37 made from plastics can be followed, even if it has elasticity and the ion remover 40 carries out volume change. Moreover, a filter 38 achieves the duty which filters the comparatively large dust in the coolant. Activated carbon 39 carries out adsorption

treatment of the unremovable organic substance in the ion remover 40. The ion remover storage bag 41 has resiliency, and permits volume change of the ion remover 40.

[0033] The ion remover 40 uses the cation system ion exchange resin which adsorbs the ion exchange resin of a cation system which adsorbs various kinds of metal ions, the anion system exchange resin which adsorbs a chlorine ion, sodium ion, and a hydrogen ion, mixing it optimum dose every. In addition, various kinds of ion exchange resin uses what performed pretreatment which does not perform a harmful ion emission in the coolant.

[0034] Moreover, since a Magnesium alloy is strong to alkalinity, it is satisfactory, but since a radiator 4, the heater core 12, intake MANHORUDO 11, etc. made from an aluminium alloy are not strong to an acid and alkali, it needs to be cautious of the blending ratio of coal of all cation system ion exchange resin and all anion system ion exchange resin so that the coolant may maintain neutrality or alkalescence.

[0035] Furthermore, since the heat-resistant temperature of anion system ion-exchange resin is also low compared with cation system ion-exchange resin and reinforcement is also weak, when water temperature is high, or when it always stirs by the strong circulating water flow, there is a possibility that a resin grain may be ground. In this example, the branching coolant path 3 is formed, and since it branches in a part of coolant and cooling water temperature is controlled by the sink and the closing motion valve 2, the worries do not exist.

[0036] The 2nd example of this invention is shown in drawing 5. This example branches from the throttle chamber 14, and forms the branching coolant path 42 between the throttle chamber 14 and a water pump 7.

[0037] since according to this example the same effectiveness as said 1st example is acquired and the branching coolant path 42 is moreover branched from the branch of an engine coolant path -- whenever [cooling solution temperature] -- a main stream -- comparing -- some -- low -- since it is ****, time amount which passes the coolant to the ion stripper 1 is made to many eyes for a while than said 1st example, and there is a merit that the degree of freedom of closing motion valve 2 anchoring also becomes large.

[0038] The 3rd example of this invention is shown in drawing 6. This example branches the branching coolant path 43 from the heater core 12, and prepares it between the heater core 12 and a water pump 7.

[0039] Also in this example, the same effectiveness as said 2nd example can be acquired.

[0040]

[Effect of the Invention] Since adsorption treatment of a metal ion and a chlorine ion harmful [in an engine coolant], and the sodium ion is carried out by the ion remover according to this invention as explained above, the corrosion of the cylinder block

made from a Magnesium alloy and the water-jacket wall of the cylinder head is prevented. Therefore, it is effective in the ability for it to be lightweight, and for vibration proof be good, and put the engine made from a Magnesium alloy excellent in endurance in practical use.

CLAIMS

[Claim 1] The cooling system of the engine characterized by having prepared the branching coolant path of another network which branched from the engine coolant path in the engine which uses a Magnesium alloy for the components in contact with an engine coolant, and arranging in this branching coolant path the ion stripper which builds in the ion remover which removes the ion in the coolant.